Abstract of the Disclosure

A brushless hybrid electrical machine for converting between electrical and mechanical energy has a rotor supported for rotation about an axis of rotation relative to a juxtaposed stator that is stationary and magnetically interacts with the rotor. The rotor includes a ferromagnetic rotor structure having two portions spaced apart, but rotating together, and defining therebetween an armature air gap. Magnetic poles are arranged in a circumferentially alternating array of ferromagnetic and permanent magnet poles, bordering the air gap. A stationary air core armature having multiple phase windings is located in the armature air gap, and a field coil is also positioned between the two portions of the rotor for generating field coil flux that flows in a flux path through the ferromagnetic poles, the armature air gap and through the ferromagnetic rotor structure. The permanent magnet poles generate permanent magnet flux that also flows in a flux path through the armature air gap and through the ferromagnetic rotor structure. The field coil flux and the permanent magnet flux induces an AC voltage in the multiple phase windings of the air core armature as said rotor rotates.